

Application No.: 09/914,356
Amendment under 37 CFR 1.111
Reply to Office Action dated April 21, 2004
August 23, 2004

REMARKS

By this amendment, the specification has been editorially amended and claims 1, 10 and 15-18 have been amended. Currently, claims 1-18 are pending in the application.

Claims 1-18 were rejected under 35 USC 103(a) as being obvious over PCT Publication No. WO 98/16680. The Examiner believed that while not teaching the specific metal chelate compound of applicants, it is the Examiner's position that the metal chelate compound of the prior art has a close structural similarity to the compounds contemplated by applicants and the expectation is that compounds similar in structure will have similar properties. The Examiner also believed that the metal chelate compounds of the prior art would have rendered the metal chelate compounds of the present invention *prima facie* obvious, in the absence of factual evidence to the contrary.

This rejection is respectfully traversed in view of the amendments to the claims and the following remarks.

The metal chelate forming fiber of the present invention has a metal chelate forming moiety. For example, the metal chelate forming moiety of the present invention has an oxygen atom

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adjacent to the carbonyl group, which constitute an ester group and hydroxyl group derived from the reaction between the epoxy group and the functional group of the metal chelate compound (see the formulas on page 19 of the specification).

For producing the above structure, the present invention discloses that at least one metal chelate-forming compound selected from the group consisting of aminodicarboxylic acids, thiocarboxylic acid and phosphoric acid which are reactive to an epoxy group, is bonded to a fiber molecule of a natural fiber or regenerated fiber through a crosslinkable compound which has a reactive double bond and a glycidyl group in its molecule.

The first advantage of the present invention is the easiness for incorporating the metal chelate-forming compound into the fiber molecule. In the present invention, the metal chelate-forming compound which is reactive to epoxy group and the crosslinkable compound which has glycidyl (epoxy) group are used respectively. This combination makes it easy to incorporate the metal chelate-forming compound into the fiber.

The second advantage of the present invention is the improved chelate-forming ability by bonding the metal chelate-forming compound to the fiber through the graft reaction product. Since the metal chelate-forming compound is bonded through the

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flexible grafted polymer (graft reaction product), the metal chelate-forming compound in the present invention can form metal chelate easier than the metal chelate-forming compound directly bonded to the fiber, due to the higher mobility. On the other hand, WO 98/16680 discloses the metal chelate-forming compound, for example polycarboxylic anhydride, is directly bonded to a fiber. Thus, the chelate-forming ability of the present invention is superior to that of WO 98/16680.

The third advantage of the present invention is that the metal chelate-forming compound can be introduced into the natural or regenerated fiber in a higher ratio (amount). In addition, in the present invention, the crosslinkable compound which has a reactive double bond and a glycidyl group in its molecule is used for graft polymerization. This system provides a glycidyl group in each unit of the crosslinkable compounds which constitute the graft polymer chain (see pages 17-19). Therefore, it is possible to increase reaction sites of the natural or regenerated fiber for metal chelate-forming compound and to introduce the metal chelate compound in a higher ratio. As a result, the chelate-forming ability will be enhanced.

Claims 1 and 18 have been amended to recite "said metal chelate-forming fiber includes a metal chelate forming moiety

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having a hydroxyl group and an oxygen atom adjacent to a carbonyl group".

Similarly, claim 10 has been amended to recite "allowing the resulting graft reaction product to be bonded with at least one metal chelate-forming compound selected from the group consisting of aminodicarboxylic acids, thiocarboxylic acids and phosphoric acid which are reactive with an epoxy group, to form a metal chelate forming moiety having a hydroxyl group and an oxygen atom adjacent to a carbonyl group".

Similarly, claims 15-17 have been amended to recite "the metal chelate-forming fiber includes a metal chelate forming moiety having a hydroxyl group and an oxygen atom adjacent to a carbonyl group".

WO 98/16680 relates to a novel metal chelate forming fiber, a process for preparing the same and a method of metal ion sequestration using the fiber.

WO 98/16680 discloses that the metal chelate forming fiber contains an acyl group which contains nitrogen and a carboxylic acid. The acyl group is introduced into a reactive functional group. The functional group has reactivity with an anhydride of polycarboxylic acid.

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WO 98/16680 also discloses that in some embodiments the fiber does not have any reactive functional group. In these cases, another reactive functional group is introduced into the molecule of the fiber by any method such as oxidization or graft polymerization for introducing the reactive functional group with an anhydride of polycarboxylic acid.

WO 98/16680 does not disclose that the metal chelate-forming fiber includes a metal chelate forming moiety having a hydroxyl group and an oxygen atom adjacent to a carbonyl group as claimed in claims 1, 10 and 15-18.

WO 98/16680 does not disclose that at least one metal chelate forming compound selected from the group consisting of aminocarboxylic acid, aminodicarboxylic acids, thiocarboxylic acid and phosphoric acid which are reactive to an epoxy group, is bonded to a fiber molecule of a natural fiber or regenerated fiber through a graft reaction product of a crosslinkable compound which has a reactive double bond and a glycidyl group in its molecule as claimed in claims as claimed in claims 1, 10 and 15-18.

Applicants respectively submit that the metal chelate forming fiber of the present invention has a metal chelate forming moiety which is different from the acyl group disclosed

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in WO 98/16680. As described above, the metal chelate forming moiety of the present invention has an oxygen atom adjacent to the carbonyl group, which constitute an ester group and hydroxyl group derived from the reaction between the epoxy group and the functional group of the metal chelate compound. On the other hand, the acyl group disclosed in WO 98/16680 has no oxygen atom adjacent to the carbonyl group and no hydroxyl group (see formula 1 of WO 98/16680).

Also, in the above structure of the present invention, applicants respectively submit that the glycidyl group is disclosed as being possible to introduce into each repeating unit of the crosslinkable compounds which constitute the graft polymer chain. As a result, it is possible to increase the introduced amount of the metal chelate-forming compound, thereby enhancing the chelate-forming ability.

The Examiner stated that "WO 98/16680 teaches that the grafting compound contains a glycidyl group in its molecule". However, applicants respectfully submit that WO 98/16680 merely discloses "glycidyl group as an example of the reactive functional group" and separately discloses "grafting polymerization for introducing the reactive functional group". The structure disclosed in WO 98/16680 does not lead to the

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crosslinkable compound which has a reactive double bond and a glycidyl group in its molecule used in the present invention. Further, applicant respectfully submits that WO 98/16680 does not suggest or disclose the fiber structure where the glycidyl group is introduced in each repeating unit of the crosslinkable compound which constitute the graft polymer chain.

For these reasons, it is respectfully submitted that WO 98/16680 does not teach or suggest the claimed features of the present invention.

Also, applicants respectfully submit that one of ordinary skill in the art would not have expected WO 98/16680 to have similar properties even though the compounds are slightly similar in structure.

In view of foregoing claim amendments and remarks, it is respectfully submitted that the application is now in condition for allowance and an action to this effect is respectfully requested.

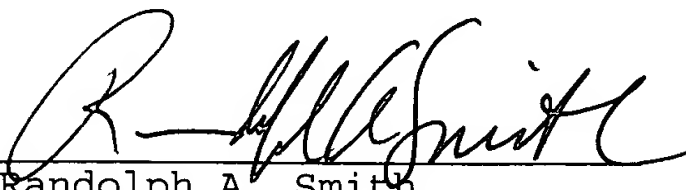
Applicants also respectfully submit that the amendments to claims 1, 10 and 15-18 were to clarify the claim language and were not done for reasons related to patentability.

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If there are any questions or concerns regarding the amendments or these remarks, the Examiner is requested to telephone the undersigned at the telephone number listed below.

Respectfully submitted,

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Randolph A. Smith
Reg. No. 32,548

SMITH PATENT OFFICE
1901 Pennsylvania Ave., N.W.,
Suite 200
Washington, DC 20006-3433
Telephone: 202/530-5900
Facsimile: 202/530-5902
Nambu082304